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both apple as well as orange juice. Find how many employees were taking neither apple nor orange juice. Also, find the number of employees who were taking only one juice.

8. Differentiate the following with respect to x :

(i) $y = \sqrt{\operatorname{cosec}(x^3 + 1)}$

(ii) $y = (\tan \sqrt{x})^{\sin x}$.

==END OF PAPER==

2112E070
(Mech. Manuf.)

BACHELOR OF VOCATION
Subject: Applied Mathematics
Subject Code: MTH-501
Semester: First
Theory (External): 70 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short/objective type in nature. All questions are compulsory. Each question carries 2 marks.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 10 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

Roll Number									

SECTION -A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x2=20 Marks)

- In how many ways 5 boys and 4 girls can be seated in a row so that all the boys sit together?
- Find the numerical value of $\sin\left(22\frac{1}{2}\right)^\circ$.
- What is the value of a if $\begin{vmatrix} 1 & a \\ a & 2 \end{vmatrix} = \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$?
- If $f(x) = e^x \sin x$, then evaluate $f'(x)$ at $x = 0$.
- In a class of 20 students, 12 speaks Hindi and 11 speaks English. How many students can speak Hindi only?
- Prove that $\cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2} \cos x$.
- Solve for the value of a and b for $\begin{bmatrix} a+2b & 2 \\ 4 & 3a-4b \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.
- Evaluate $\frac{d}{dx}(\cos x)^{x^2}$.
- Evaluate $\int \frac{dx}{x^2-5x+6}$.
- If $\frac{1}{6!} - \frac{1}{7!} = \frac{x}{8!}$. Then find the value of x .

SECTION -B (ESSAY TYPE QUESTIONS)
(5x10=50 Marks)

- (i) How many 5 letters word can be formed from the alphabets of the word QUESTION, when all the vowels are occurring together?
(ii) Find the coefficient of x^5y^4 in the expansion $(x + 2y)^9$.

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- (i) Prove that:

$$\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1.$$

- (ii) Is $3! + 4! = 7!$?

- Solve the following equations by crammer's rule

$$\begin{aligned} x + y + z &= 3 \\ 2x + 2y + z &= -2 \\ x + 2y + 4y &= -1 \end{aligned}$$

- (i) If a, b and c are in A. P., then evaluate $\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix}$.
(ii) Find the value of $\int \cos^4 x \sin^3 x \, dx$.

- (i) Find the inverse of matrix by adjoint method:

$$\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$$

- (ii) Find the determinant of the matrix: $\begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & -2 \\ 5 & -2 & 4 \end{vmatrix}$.

- Find the value of

- (i) $\int \frac{e^x(1+\tan^{-1}x)}{1+x^2} dx$;

- (ii) $\int \frac{x^2+x+1}{(x^2-1)(x-2)} dx$.

- In a survey of 400 colleague in a company, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking